Significant Figures Practice Worksheet

How many significant figures do the following numbers have?

1) 1234 4

2) 0.023 2

3) 890 2

4) 91010 4

5) 9010.0 5

6) 1090.0010 8

7) 0.00120 3

8) 3.4×10^{4} 2

9) 9.0×10^{-3} 2

10) 9.010×10^{-2} 4

11) 0.00030 2

12) 1020010 6

13) 780. 3

14) 1000 1

15) 918.010 6

16) 0.0001 1

17) 0.00390 3

18) 8120 3

19) 7.991×10^{-10} 4

20) 72 2

SCIENTIFIC NOTATION
PROGRAMMED INSTRUCTION

Worksheet #4 Name _____

*Objective: Convert exponential notation to **proper** scientific notation.*

Example: $623 \times 10^{-6} = 6.23 \times 10^{-4}$ (notice that the decimal point is not in the correct place in the first value...this is not proper scientific notation)

STEPS:

1) Move the decimal point to the "proper" place. (Between the first and second digit.)
   Example: Move it from 623 to 6.23
2) Did the value of the number increase or decrease?
   Example: When you changed 623 to 6.23, you decreased the number's value.
3) Change the exponent the correct amount and in the correct direction so that it "cancels" the change in the number's value. (When the number value is increased (decimal point moved to the right) the the exponent must be decreased. When the number value is decreased the exponent must be increased.)
   *Example: 623 was **decreased** to 6.23, therefore the exponent must be **increased** from -6 to -4. (Be careful of negative numbers!!!)*

A) Convert the following numbers from exponential notation to proper scientific notation:

1) $65. \times 10^{-4}$ 6.5×10^{-3}

2) 0.062×10^{6} 6.2×10^{4}

3) $0.009\,56 \times 10^{5}$ 9.56×10^{2}

4) 0.32×10^{-2} 3.2×10^{-3}

5) 0.63×10^{-2} 6.3×10^{-3}

6) 18.3×10^{12} 1.83×10^{13}

7) 81×10^{7} 8.1×10^{8}

8) 23.7×10^{-1} 2.37×10^{0}

9) $300. \times 10^{8}$ 3.00×10^{10}

10) $0.008\,72 \times 10^{-3}$ 8.72×10^{-6}

SCIENTIFIC NOTATION
PROGRAMMED INSTRUCTION

Worksheet #5 Name _____

Objective: Multiply scientific notation
Example: $7.3 \times 10^{-3} \times 2.0 \times 10^{6}$

STEPS:

1) To find the "number part" of the answer, multiply the numbers of the problem.
Example: 7.3 x 2.0 = 14.6

2) To find the exponent of the answer, add the exponents from the problem.
(Be careful of negative numbers!!)
Example: -3 + 6 = 3

3) Check that the answer is **proper** scientific notation and change it if necessary. (The "number part" must be equal to or greater than 1 & less than 10.)
Example: 14.6×10^{3} is not proper scientific notation so it should be changed to 1.46×10^{4}.

A) Convert the following numbers from conventional notation to scientific notation:

1) $7.3 \times 10^{3} \times 2.0 \times 10^{6}$
1.46×10^{10}

2) $4.2 \times 10^{-3} \times 6.0 \times 10^{23}$
252×10^{21}

3) $6.9 \times 10^{-5} \times 1.1 \times 10^{7}$
7.59×10^{2}

4) $7.0 \times 10^{7} \times 3.2 \times 10^{-11}$
2.24×10^{-3}

5) $2.3 \times 10^{-3} \times 2.0 \times 10^{-6}$
4.6×10^{-9}

6) $1.3 \times 10^{2} \times 4.8 \times 10^{9}$
6.24×10^{11}

7) $3.7 \times 10^{13} \times 5.0 \times 10^{10}$
1.85×10^{24}

8) $2.9 \times 10^{3} \times 2.0 \times 10^{3}$
5.8×10^{6}

9) $8.3 \times 10^{4} \times 6.88 \times 10^{-6}$
5.7104×10^{-1}

10) $3.1 \times 10^{11} \times 6.02 \times 10^{23}$
1.8662×10^{35}

SCIENTIFIC NOTATION
PROGRAMMED INSTRUCTION

Worksheet #6 Name _____

Objective: Divide scientific notation
Example: $7.3 \times 10^{-3} \div 8.0 \times 10^{6}$

STEPS:

1) To find the "number part" of the answer, divide the numbers of the problem.
Example: 7.3 ÷ 2.0 = 0.91 (follow significant digits rules)

2) To find the exponent of the answer, subtract the exponents from the problem in the order they are given. (Be careful of negative numbers!!)
Example: -3 - 6 = -9

3) Check that the answer is **proper** scientific notation and change it if necessary. (The "number part" must be equal to or greater than 1 & less than 10.)
Example: 0.91×10^{9} is not proper scientific notation so it should be changed to 9.1×10^{10}.

A) Convert the following numbers from conventional notation to scientific notation:

1) $7.3 \times 10^{3} \div 2.0 \times 10^{6}$
$3.65 \times 10^{-3} \rightarrow 3.7 \times 10^{-3}$

2) $4.2 \times 10^{-3} \div 6.0 \times 10^{23}$
$7 \times 10^{-27} \rightarrow 7.0 \times 10^{-27}$

3) $6.9 \times 10^{-5} \div 1.1 \times 10^{7}$
$6.27272727 \times 10^{-12} \rightarrow 6.3 \times 10^{-12}$

4) $7.0 \times 10^{7} \div 3.2 \times 10^{-11}$
$2.1875 \times 10^{18} \rightarrow 2.2 \times 10^{18}$

5) $2.3 \times 10^{-3} \div 2.0 \times 10^{-6}$
$1.15 \times 10^{3} \rightarrow 1.2 \times 10^{3}$

6) $1.3 \times 10^{2} \div 4.8 \times 10^{9}$
$2.708333333 \times 10^{-8}$ 2.7×10^{-8}

7) $3.7 \times 10^{13} \div 5.0 \times 10^{10}$
7.5×10^{2}
4

8) $2.9 \times 10^{3} \div 2.0 \times 10^{3}$
$1.45 \times 10^{0} \rightarrow 1.5 \times 10^{6}$

9) $8.3 \times 10^{4} \div 6.88 \times 10^{-6}$
$1.206395349 \times 10^{10}$
$\rightarrow 12 \times 10^{10}$

10) $3.1 \times 10^{11} \div 6.02 \times 10^{23}$
$5.14950166 \times 10^{-13} \rightarrow 5.1 \times 10^{-13}$

SCIENTIFIC NOTATION
PROGRAMMED INSTRUCTION

Worksheet #7 Name _____

Objective: Add or subtract scientific notation
Example: $7.3 \times 10^{-3} + 2.0 \times 10^{-2} = 7.5 \times 10^{-3}$

STEPS:

1) Change the smaller exponent to be the same value as the larger. (Remember to also move the decimal point.)
Example: 2.0×10^{-2} should be changed to 0.20×10^{-3}

2) To find the number part, add the numbers (or subtrract them in a subtraction problem).
Example: 7.3 + 0.20 = 7.5 (Follow significant digit rules.)

3) The exponent of the answer is the same as the exponents in the problem.
Example: The answer is also $\times 10^{-3}$

4) Check to see that the answer is in **proper** scientific notation and change it, if not. (It probably is *if* you changed the small exponent to the larger exponent.)

A) Convert the following numbers from conventional notation to scientific notation:

1) $7.3 \times 10^{3} + 2.0 \times 10^{4}$
$2.73 \times 10^{4} \rightarrow 7.7 \times 10^{4}$

2) $4.2 \times 10^{24} - 6.0 \times 10^{23}$
3.6×10^{24}

3) $6.9 \times 10^{-6} + 1.1 \times 10^{-7}$
$7.01 \times 10^{-6} \rightarrow 7.0 \times 10^{-6}$

4) $7.0 \times 10^{-12} - 3.2 \times 10^{-11}$
-2.5×10^{-11}

5) $2.3 \times 10^{7} + 2.0 \times 10^{6}$
2.5×10^{7}

6) $1.3 \times 10^{10} - 4.8 \times 10^{9}$
8.2×10^{9}

7) $3.70 \times 10^{13} + 5.20 \times 10^{11}$
$3.752 \times 10^{13} \rightarrow 3.75 \times 10^{13}$

8) $2.9 \times 10^{3} - 2.0 \times 10^{3}$
$9 \times 10^{2} \rightarrow 9.0 \times 10^{2}$

9) $8.304 \times 10^{4} + 6.88 \times 10^{6}$
$6.96304 \times 10^{6} \rightarrow 6.96 \times 10^{6}$

10) $3.10 \times 10^{11} - 6.02 \times 10^{9}$
$3.0398 \times 10^{11} \rightarrow 3.10 \times 10^{11}$

Significant Figures Worksheet

1. Determine the number of significant digits in each of the following:

a) 6.571 g 4	f) 30.07 g 4	k) 54.52 cm 4
b) 0.157 kg 3	g) 0.106 cm 3	l) 0.12090 mm 5
c) 28.0 ml 3	h) 0.0067 g 2	m) 2.690 g 4
d) 2500 m 2	i) 0.0230 cm 3	n) 43.07 cm 4
e) 0.0700000 g 6	j) 26.509 cm 5	

2. Add:
   a) 16.5 + 8 + 4.37 $28.87 \rightarrow 29$
   b) 13.25 + 10.00 + 9.6 $32.85 \rightarrow 32.9$
   c) 2.36 + 3.38 + 0.355 + 1.06 $7.155 \rightarrow 7.16$
   d) 0.0853 + 0.0547 + 0.0370 + 0.00387 $0.18087 \rightarrow 0.1809$
   e) 25.37 + 6.850 + 15.07 + 8.056 $55.346 \rightarrow 55.35$

3. Subtract:
   a) 23.27 - 12.058 $11.212 \rightarrow 11.21$
   b) 13.57 - 6.3 $7.27 \rightarrow 7.3$
   c) 350.0 - 200 $150 \rightarrow 200$
   d) 27.68 - 14.369 $13.311 \rightarrow 13.31$

4. Multiply:
   a) 2.6 x 3.78 $9.828 \rightarrow 9.8$
   b) 6.54 x 0.37 $2.4198 \rightarrow 2.4$
   c) 3.15 x 2.5 x 4.00 $31.5 \rightarrow 32$
   d) 0.085 x 0.050 x 0.655 $0.00278375 \rightarrow 0.0028$
   e) 3.08 x 5.2 $16.016 \rightarrow 16$
   f) 0.0036 x 0.02 $0.000072 \rightarrow 0.00007$
   g) 4.35 x 2.74 x 3.008 $35.852352 \rightarrow 35.9$
   h) 35.7 x 0.78 x 2.3 $64.0458 \rightarrow 64$

5. Divide:
   a) 35 / 0.62 56
   b) 39 / 24.2 1.6
   c) 0.58 / 2.1 0.28
   d) 40.8 / 5.05 8.08
   e) 3.76 / 1.62 2.32
   f) 0.075 / 0.030 2.5

6. Express the Following in Scientific Notation:
   a) 0.000 03 3×10^{-5}
   b) 8 000 000 8×10^{6}
   c) 55 000 000 55×10^{7}
   d) 0.002 2×10^{-3}
   e) 0.000 007 7×10^{-6}
   f) 65 000 6.5×10^{4}

7. Do the Following Calculations Using Scientific Notation:
   a) 0.0005 x 0.002 $(5 \times 10^{-4})(2 \times 10^{-3}) = 10 \times 10^{-7} = 1 \times 10^{-6}$
   b) 5000 000 x 6000 $(5 \times 10^{6})(6 \times 10^{3}) = 30 \times 10^{9} = 3 \times 10^{10}$
   c) 65 000 x 0.003 $(6.5 \times 10^{4})(3 \times 10^{-5}) = 19.5 \times 10^{-1} = 1.95 \times 10^{2} = 2 \times 10^{2}$
   d) 750 000 x 20 000 x 3000 $(7.5 \times 10^{5})(2 \times 10^{4}) = 15 \times 10^{9} = 1.5 \times 10^{10} = 2 \times 10^{2}$
   e) 9 000 / 300 $9 \times 10^{3} / 3 \times 10^{2} = 3 \times 10^{1}$
   f) 400 / 20 000 $4 \times 10^{2} / 2 \times 10^{4} = 2 \times 10^{-2}$
   g) 0.008 / 0.00002 $8 \times 10^{-3} / 2 \times 10^{-5} = 4 \times 10^{2}$
   h) (60 000 x 7000) / 1000 $(6 \times 10^{4})(7 \times 10^{3}) / 1 \times 10^{3} = 42 \times 10^{4} = 4.2 \times 10^{5} = 4 \times 10^{5}$
   i) (0.0006 x 0.002) / 0.0003 $(6 \times 10^{-4})(2 \times 10^{-3}) / 3 \times 10^{-4} = 4 \times 10^{-3}$
   j) (0.0006 x 8000) / 120 $(6 \times 10^{-4})(8 \times 10^{3}) / 1.2 \times 10^{2} = 40 \times 10^{-3} = 4 \times 10^{-2}$
   k) (400 000 x 0.0008 x 3 000) / (0.0002 x 0.0006) $(4 \times 10^{5})(8 \times 10^{-4})(3 \times 10^{3}) / (2 \times 10^{-4})(6 \times 10^{-4}) = 8 \times 10^{12}$

K h da b d c m

Name Key
Date _____ Hour _____

Metric Conversion Worksheet

Convert the following. Write your answers in the spaces provided.

1. 256 m = 25600 cm
2. 97.25 cm = 972.5 mm
3. 952 g = 952000 mg
4. .574 m = 57.4 cm
5. 5.287 l = 5287. ml
6. 785.3 km = 785300 m
7. 84.363 km = 8436300 cm
8. 872 km = 872,000,000 mm
9. 95,824 cm = 958240 mm
10. 8.26 kl = 8260000 ml
11. 36 mm = 3.6 cm
12. 857 cm = 8570 mm
13. 8.52 mg = 0.00852 g
14. 975 mm = 97.5 cm
15. 9,824 cm = 98.24 m
16. 74.21 cm = 0.000742l km
17. .254 g = 0.000254 kg
18. 96 mm = 0.000096 km
19. 12.5 cm = 0.125 m
20. .85 ml = 0.00085 l
21. 86 g = 86000 mg
22. 87.2 mm = 8.72 cm
23. 1 mm = 0.1 cm
24. 973.5 cm = 0.009735 km
25. .534 cm = 0.00534 m
26. 984 g = 0.984 kg
27. 8.64 m = 8640 mm
28. 64.3 ml = 0.0643 l
29. 8.47 km = 8470 m
30. 74,201 mm = 0.074201 km
31. .24 mg = 0.00000024 kg
32. 7.4 kl = 7400 l
33. 874 m = 87400 cm
34. 1 cm = 0.00001 km
35. 8.412 mm = 0.008412 m
36. 68.2 mg = 0.0682 g
37. 8.5743 cm = 0.000085743 km
38. 95,870 m = 95870000 mm
39. 547 kl = 547000000 ml
40. 1 km = 1000000 mm

Name _____ Period _____

Density Worksheet

In order to receive full credit, you must show ALL work and circle your final answer.

1. 100 grams of a liquid completely fill a 200 mL bottle. What is the density of the liquid?

$D = \frac{m}{V}$ $D = \frac{100\,g}{200\,mL} = \boxed{0.5\,\frac{g}{mL}}$

2. A solution has a density of 1.50 g/mL. How many grams are needed to obtain 10.0 mL of solution?

$D = \frac{m}{V}$ $m = DV$ $1.50\,\frac{g}{mL} \cdot 10\,mL = \boxed{15.0\,g}$

3. If a block of copper measures 2.00 cm x 4.00 cm x 5.00 cm and weighs 356 grams, what is its density?

$D = \frac{M}{V}$ $\frac{356\,g}{(2.00\,cm \times 4.00\,cm \times 5.00\,cm)} = \frac{356\,g}{40.0\,cm^3} = \boxed{8.90\,\frac{g}{cm^3}}$

4. The density of mercury is 13.6 g/mL.

   a. what is the mass of 8.20 mL of mercury?

$D = \frac{m}{V}$ $m = DV$ $13.6\,\frac{g}{mL} \cdot 8.20\,mL = 111.52\,g \rightarrow \boxed{112\,g}$

   b. what volume would 120 grams of mercury occupy?

$D = \frac{m}{V}$ $V = \frac{m}{D}$ $D = 120\,g \cdot \frac{mL}{13.6\,g} = \boxed{8.8\,mL}$

5. A piece of silver has a mass of 2800 grams and occupies a volume of 266 cm^3. What is the density of silver?

$D = \frac{m}{V}$ $D = \frac{2800\,g}{266\,cm^3} = 10.526\ldots \rightarrow \boxed{11\,g/cm^3}$

6. A bottle has a capacity of 1.2 liters. If the density of ether is 0.74 g/mL, what mass of ether can the bottle hold?

1.2L = 1200mL

$D = \frac{m}{V}$ $m = DV$ $0.74\frac{g}{mL} \cdot 1200mL = 888g \rightarrow \boxed{890g}$

7. A student pipets 5.00 mL of ethanol into a flask weighing 15.25 grams. She finds that the mass of the flask *plus* ethanol = 19.17 grams. Calculate the density of ethyl alcohol.

$D = \frac{m}{V}$ $D = \frac{(19.17 - 15.25)}{5.00} = \frac{3.92}{5.00} = \boxed{0.784\ g/mL}$

8. Peanut oil has a density of 0.92 g/mL. If a recipe calls for ¼ cup of peanut oil, what mass of peanut oil is required? (Hint: 1 cup = 237 mL).

$D = \frac{m}{V}$ $m = DV$ ~~$0.92\frac{g}{mL} \cdot 237mL$~~

$0.25\text{c}\left(\frac{237mL}{1c}\right)\left(\frac{0.92g}{1mL}\right) = 54.57g$

$\boxed{55g}$

9. A chemist needs 2.00 g of a liquid compound, which has a density of 0.718 g/mL. If the compound costs $5.67 **per mL**, how much will a 2.0 gram sample cost?

$D = \frac{m}{V}$ $V = \frac{m}{D}$

$2.00g\left(\frac{1mL}{0.718g}\right)\left(\frac{\$5.67}{1mL}\right) = \$15.79$

10. Suppose you find a chunk of what *appears* to be gold in the sand at the beach. Devise a simple experiment to determine whether or not you've struck it rich. Please list all lab equipment required and list the **specific** steps you would take.

1- determine the mass
2- determine the volume (by displacement)
3- divide the mass by the volume to determine density.